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FCC ROUNDTABLE ON
THE ECONOMICS OF MERGERS BETWEEN LARGE ILECS

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Friday, February 5, 1999

The Commission Meeting Room
The Portals II, 445 12th St. S.W., Washington, DC

ROUNDTABLE PARTICIPANTS

Moderator: William Rogerson, Chief Economist, FCC
Panelists: Dennis Carlton, University of Chicago
Robert Crandall, Brookings Institution
Joseph Farrell, UC Berkeley
Robert Gertner, University of Chicago
Richard Gilbert, UC Berkeley
Michael Katz, UC Berkeley
Robert Litan, Brookings Institution
Roger Noll, Stanford University
William Sheperd, University of Massachusetts

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98-141

AGENDA

9:00 - 9:15	Welcome	
9:15 - 10:00	Session 1	Potential Benefits of the Mergers
5 minutes of opening remarks by Dennis Carlton, Robert Gertner and Roger Noll		
10:00 - 10:45	Session 2	Effects on Benchmarking/Diversity
5 minutes of opening remarks by Joseph Farrell, Robert Crandall, and Dennis Carlton		
10:45 - 11:00	Break	
11:00 - 11:45	Session 3	Effects on Actual and Potential Competition
5 minutes of opening remarks by Robert Litan, William Sheperd, and Richard Gilbert		
11:45 - 12:30	Session 4	Effects on Ability and Incentive of ILECs to Raise Rivals' Costs
5 minutes of opening remarks by Michael Katz and Dennis Carlton		
12:30 - 12:45	Session 5	Conclusions and Final Remarks

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EDUCATION

Ph.D., MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts:
Economics, 1975.

M.S., MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts: Operations
Research, 1974.

A.B., HARVARD UNIVERSITY (Summa cum laude): Applied Math and Economics, 1972.

EMPLOYMENT

LEXECON INC., Chicago, Illinois (1977 - present): President, 1997 - present.

UNIVERSITY OF CHICAGO, Graduate School of Business (1984 - present): Professor of
Economics.

UNIVERSITY OF CHICAGO, Law School (1980 - 1984): Professor of Economics.

UNIVERSITY OF CHICAGO, Department of Economics: Assistant Professor (1976 - 1979):
Associate Professor (1979 - 1980).

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, Massachusetts, Department of
Economics (1975 - 1976): Instructor in Economics.

OTHER PROFESSIONAL EXPERIENCE

HARVARD UNIVERSITY, Public Policy Summer Course in Economics (1977): Professor.

BELL TELEPHONE LABORATORIES (Summers 1976, 1977).

JOINT CENTER FOR URBAN STUDIES OF M.I.T. AND HARVARD UNIVERSITY, Cambridge,
Massachusetts (1974 - 1975).

CHARLES RIVER ASSOCIATES, Cambridge, Massachusetts (Summers 1971, 1972): Research
Assistant.

FIELDS OF SPECIALIZATION

Theoretical and Applied Microeconomics

Industrial Organization

ACADEMIC HONORS AND FELLOWSHIPS

M.I.T., National Scholar Award, 1968

Edwards Whitacker Award, 1969

Detur Book Prize, 1969

John Harvard Award, 1970

Phi Beta Kappa, 1971

National Science Foundation Fellowship, 1972 - 1975

Recipient of Post-doctoral Grant from the Lincoln Foundation, 1975

National Science Foundation Grant, 1977 - 1985

Recipient of the 1977 P.W.S. Andrews Memorial Prize Essay, best essay in the field of Industrial Organization by a scholar under the age of thirty

Ph.D. Thesis chosen to appear in the Garland Series of Outstanding Dissertations in Economics

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Co-editor, Journal of Law and Economics, 1980 - present

Associate Editor, Regional Science and Urban Economics, 1987 - 1997

Associate Editor, The International Journal of Industrial Organization, 1991 - 1995

Member, American Economics Association, Econometrics Society

National Bureau of Economic Research, Research Associate

Member, Advisory Committee to the Bureau of the Census, 1987 - 1990

Editorial Board, Intellectual Property Fraud Reporter, 1990 - 1995

Consultant on Merger Guidelines to the U.S. Department of Justice, 1991 - 1992

Accreditation Committee, Graduate School of Business, Stanford University, 1995

Visiting Committee, Massachusetts Institute of Technology, Department of Economics, 1995 - present

Resident Scholar, Board of Governors of the Federal Reserve System, Summer, 1995

Member, Advisory Board, Economics Research Network, 1996 - present

Member, Steering Committee, Social Science Research Council, Program in Applied Economics, 1997 - 1999

Participant in meetings with Committee of the Federal Reserve on Payment Systems, June 5, 1997

Participant in round table discussions on "The Role of Classical Market Power in Joint Venture Analysis," before the Federal Trade Commission, November 19, 1997 and March 17, 1998.

Member, Advisory Board of Antitrust and Regulation Abstracts, Social Science Research Network, 1998 - present

BOOKS

"Market Behavior Under Uncertainty," Ph.D. Thesis, Massachusetts Institute of Technology (September 1975); Garland Publishing (1984).

Modern Industrial Organization, Scott, Foresman & Co., co-authored with Jeffrey Perloff, second edition (1994), first edition (1990).

RESEARCH PAPERS

- "The Equilibrium Analysis of Alternative Housing Allowance Payments," (with Joseph Ferreira) Chapter 6 of Analysis of a Direct Housing Allowance Program, The Joint Center for Urban Studies of M.I.T. and Harvard University, (July 1975).
- "Theories of Vertical Integration," presented at Fourth Annual Telecommunications Conference. Appears in a volume of Proceedings of the Fourth Annual Telecommunications Conference, Office of Telecommunications Policy, (April 1976).
- "Uncertainty, Production Lags, and Pricing," American Economic Review, (February 1977).
- "Selecting Subsidy Strategies for Housing Allowance Programs," (with Joseph Ferreira) Journal of Urban Economics, (July 1977).
- "Peak Load Pricing With Stochastic Demand," American Economic Review, (December 1977). (Reprinted in Economic Regulation edited by P.L. Joskow, Edward Elgar Publishing Limited, 1998.)
- "The Distribution of Permanent Income," (with Robert Hall) presented at the Symposium on Income Distribution and Economic Inequality, (May 1976). Published in Income Distribution and Economic Inequality, edited by Zvi Griliches, et al. (Halsted Press, 1978).
- "Market Behavior with Demand Uncertainty and Price Inflexibility," American Economic Review, (September 1978).
- "Why New Firms Locate Where They Do: An Econometric Model," in Studies in Regional Economics, edited by W. Wheaton, (Urban Institute, 1980). Presented at the Conference on Regional Economics, sponsored by the Committee on Urban and Public Affairs, Baltimore, Maryland (May 1978).
- "Vertical Integration—An Overview," in Congressional Record Hearings on the Communications Act of 1978. Bill H.R. 13105, (August 3, 1978).
- "Vertical Integration in Competitive Markets Under Uncertainty," Journal of Industrial Economics, (March 1979). Awarded the P.W.S. Memorial Prize for the best essay in the field of Industrial Organization by a scholar under the age of thirty.
- "Valuing Benefits and Costs in Related Output and Input Markets," American Economic Review, (September 1979).
- "Contracts, Price Rigidity and Market Equilibrium," Journal of Political Economy, (October 1979).
- "Benefits and Costs of Airline Mergers: A Case Study," (with W. Landes and R. Posner) Bell Journal of Economics, (Spring 1980).
- "The Limitations of Pigouvian Taxes as a Long Run Remedy for Externalities," (with G. Loury) Quarterly Journal of Economics, (September 1980).
- "The Law and Economics of Rights in Valuable Information: A Comment," Journal of Legal Studies, (December 1980).

- "Price Discrimination: Vertical Integration and Divestiture in Natural Resources Markets," (with J. Perloff) Resources and Energy, (March 1981).
- "The Spatial Effects of a Tax on Housing and Land," Regional Science and Urban Economics, (November 1981).
- "Comments on Weicher," Journal of Law and Economics, (December 1981).
- Comment, in Sherwin Rosen ed. Studies in Labor Markets, University of Chicago Press, (1981).
- "Planning and Market Structure," in The Economics of Information and Uncertainty, edited by J.J. McCall, University of Chicago Press, (1982).
- "The Disruptive Effect of Inflation on the Organization of Markets," in Robert Hall, ed. The Economics of Inflation, University of Chicago Press, (1982).
- "A Reexamination of Delivered Pricing," Journal of Law and Economics, (April 1983).
- "Futures Trading, Market Interrelationships, and Industry Structure," American Journal of Agricultural Economics, (May 1983).
- "The Location and Employment Choices of New Firms: An Econometric Model with Discrete and Continuous Endogenous Variables," The Review of Economics and Statistics, (August 1983).
- "The Need for Coordination Among Firms With Special Reference to Network Industries," (with J. M. Klammer) University of Chicago Law Review, (Spring 1983).
- "The Regulation of Insider Trading" (with D. Fischel), Stanford Law Review, (May 1983).
- "Economic Goals and Remedies of the AT&T Modified Final Judgement" (with W. Lavey), Georgetown Law Review, (August 1983).
- "Equilibrium Fluctuations When Price and Delivery Lags Clear the Market," Bell Journal of Economics, (Autumn 1983).
- "Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures," paper presented at the Columbia University Conference on Futures Markets, February 1984, Journal of Futures Markets, (September 1984). (Reprinted in Futures Markets edited by A.G. Malliaris and W.F. Mullady, Edward Elgar Publishing Limited, 1995.)
- "Energy and Location," presented at the Brookings Conference on Housing and Energy, Washington, D.C., (November 1981), Energy Costs, Urban Development, and Housing, Brookings Institution, (1984).
- "The Limitations of Pigouvian Taxes As A Long Run Remedy for Externalities: Extension of Results," (with G. Loury) Quarterly Journal of Economics, (August 1986).
- "The Rigidity of Prices," American Economic Review, (September 1986).

- "The Theory and The Facts of How Markets Clear: Is Industrial Organization Valuable for Understanding Macroeconomics?" in Handbook of Industrial Organization, eds. Schmalensee and Willig, (1989).
- "Market Power and Mergers in Durable Good Industries," (with R. Gertner), Journal of Law and Economics, (October 1989).
- Comments on Vertical Foreclosure, Brookings Papers on Economic Activity, (December 19, 1989).
- Book Review of Tirole's The Theory of Industrial Organization, Journal of Political Economy, (June 1990).
- "The Genesis of Inflation and the Costs of Disinflation: Comment," Journal of Money, Credit & Banking, (August 1991, Part 2).
- "The Theory of Allocation and its Implications for Marketing and Industrial Structure: Why Rationing is Efficient," Journal of Law and Economics, (October 1991).
- "The Economics of Cooperation and Competition in Electronic Services Network Industries," in Economics of Electronic Service Networks, Wildman Steven ed., Praeger Press, (1992).
- "Merger Policy and Market Definition Under the EC Merger Regulation," Conference on Antitrust in a Global Economy, Fordham Corporate Law Institute, (1994).
- "The Antitrust Economics of Credit Card Networks," (with A. Frankel) Antitrust Law Journal, (Winter 1995).
- "Economic Organization and Conflict," Journal of Institutional and Theoretical Economics, (March 1995).
- "Antitrust and Higher Education: Was There a Conspiracy to Restrict Financial Aid?" (with G. Bamberger and R. Epstein) The Rand Journal of Economics, (Vol. 26, No. 1, Spring 1995, pp. 131-147).
- "The Competitive Effects of Line-of-business Restrictions in Telecommunications," (with K. Arrow and H. Sider), Managerial and Decision Economics, (Vol. 16, pp. 301-321, 1995). (Reprinted in Deregulating Telecommunications - The Baby Bells Case for Competition, edited by Richard S. Higgins and Paul H. Rubin, John Wiley & Sons Ltd., 1995.)
- "The Antitrust Economics of Credit Card Networks: Reply to Evans and Schmalensee," (with A. Frankel), Antitrust Law Journal, (Spring 1995).
- "Antitrust and Payment Technologies," (with A. Frankel), Review, Federal Reserve Bank of St. Louis (November/December 1995).
- "Antitrust Policy Toward Mergers When Firms Innovate: Should Antitrust Recognize the Doctrine of Innovation Markets?" Testimony before the Federal Trade Commission Hearings on Global and Innovation-based Competition (October, 1995).
- "You Keep on Knocking But You Can't Come In: Evaluating Restrictions on Access to Input Joint Ventures," (with S. Salop), Harvard Journal of Law & Technology, (Volume 9, Summer, 1996).

- "Comments on Causes and Consequences of Airline Fare Wars," Micro Brookings Papers on Economic Activity, (1996).
- "A Critical Assessment of the Role of Imperfect Competition in Macroeconomics," in Market Behaviour and Macro Economic Modeling, Brakman, Van Ees, & Kuipers (eds.), MacMillan Press (1997).
- "Price Rigidity," Business Cycles and Depressions, David Glasner ed., Garland Publishing, Inc., (1997).
- "Communication Among Competitors: Game Theory and Antitrust," (with R. Gertner and A. Rosenfield), George Mason Law Review, (1997).
- "Antitrust and Higher Education: MIT Financial Aid (1993)" (September 1997) (with G. Bamberger), The Antitrust Revolution, (Oxford University Press), 3rd edition (1999).
- "An Analysis of the Toys 'R' Us Case," (with H. Sider), Forensic Economics, The Role of the Academic Economist in Litigation Support, edited by Daniel Slottje, North Holland, (1999).

UNPUBLISHED PAPERS

- "Modeling the Housing Allowance Program," M.A. Thesis, Massachusetts Institute of Technology (September 1974).
- "The Cost of Eliminating a Futures Market and The Effect of Inflation on Market Interrelationships," (1984).
- "The Empirical Importance of Delivery Lags as an Explanation of Demand," (1984).
- "Airline Networks and Fares," (with G. Bamberger), (1996).
- "The Choice of Organizational Form in Gasoline Retailing and The Costs of Laws Limiting that Choice," (with A. Blass), (1996).
- "Statistical Supplement to The Antitrust Economics of Credit Card Networks: Reply to Evans and Schmalensee Comment, 63 Antitrust Law Journal 903 (1995)," (with Alan Frankel), (May 1997).
- "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," (with M. Waldman), Working Paper No. 145, George J. Stigler Center for the Study of the Economy and the State, University of Chicago (1998).
- "Inferring Values from Jewish Attitudes Toward Competition," (with A. Weiss), presented at the International Conference on Law, Jewish Law and Economics, Bar-Ilan University, Israel, December 1998.

ROBERT W. CRANDALL

CURRENT POSITION:

Senior Fellow, The Brookings Institution, 1978 - Present

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FIELDS OF SPECIALIZATION:

Industrial Organization, Antitrust Policy, Regulation

PREVIOUS POSITIONS:

Adjunct Professor, School of Public Affairs, University of Maryland, 1987 - 1993
Deputy Director, Council on Wage and Price Stability, 1977 - 1978
Acting Director, Council on Wage and Price Stability, 1977
Adjunct Associate Professor of Economics, George Washington University, 1975 - 1977
Assistant Director, Council on Wage and Price Stability, 1975 - 1977
Associate Professor of Economics, M.I.T., 1972 - 1974
Assistant Professor of Economics, M.I.T., 1966 - 1972
Johnson Research Fellow, The Brookings Institution, 1965 - 1966
Instructor, Northwestern University, 1964 - 1965
Consultant to Environmental Protection Agency, Antitrust Division Federal Trade Commission, Treasury Department, various years

EDUCATION:

Ph.D., Economics, Northwestern University, 1968
M.A., Economics, Northwestern University, 1965
A.B., Economics, University of Cincinnati, 1962

Changing the Rules: Technological Change, International Competition and Regulation in Communications. (Edited with Kenneth Flamm), Washington, DC: The Brookings Institution, 1989.

Up from the Ashes: The U.S. Minimill Steel Industry. (With Donald F. Barnett), Washington, DC: The Brookings Institution, 1986.

Regulating the Automobile. (With Howard K. Gruenspecht, Theodore E. Keeler, and Lester B. Lave), Washington, DC: The Brookings Institution, 1986.

Controlling Industrial Pollution: The Economics and Politics of Clean Air. Washington, DC: The Brookings Institution, 1983.

The Scientific Basis of Health and Safety Regulation. (Ed. with Lester Lave), Washington, DC: The Brookings Institution, 1981.

The U.S. Steel Industry in Recurrent Crisis. Washington, DC: The Brookings Institution, 1981.

Articles, Reports, and Contributions to Edited Volumes:

"Telephone Subsidies, Income Redistribution, and Economic Welfare," in Roger G. Noll and Monroe E. Price, A Communications Cornucopia: Markle Foundation Essays on Information Policy. Washington: The Brookings Institution, 1998.

"Electric Restructuring and Consumer Interests: Lessons from Other Industries," The Electricity Journal, Volume 11, No. 1, January/February 1998.

"Is it Time to Eliminate Telephone Regulation?" in Donald L. Alexander (ed.), Telecommunications Policy: Have Regulators Dialed the Wrong Number?, Westport, CT: Praeger, 1997, pp. 17-30.

"Competition and Regulation in the U.S. Video Market," Telecommunications Policy, Vol. 21, No. 7, 1997, pp. 649-660.

"Are We Deregulating Telephone Services? Think Again." Brookings Policy Brief, Number 13, March 1997

"Are Telecommunications Facilities 'Infrastructure?' If They Are, So What? Regional Science and Urban Economics, 27 (1997), pp. 161-79.

"Economic Deregulation and Customer Choice: Lessons for the Electric Utility Industry." (with Jerry Ellig), Center for Market Processes, George Mason University, 1997.

"From Competitiveness to Competition: The Threat of Minimills to Large National Steel Companies," Resources Policy, Vol. 22, Nos. 1/2, March/June 1996, pp.107-118.

"Clearing the Air: EPA's Self-Assessment of Clean-Air Policy," (with Frederick H. Rueter and Wilbur A. Steger), Regulation, 1996, Number 4, pp. 35-46.

"Phone Rates in a Deregulated Market," The Brookings Review, Summer 1996.

"Competition and Regulatory Policies for Interactive Broadband Networks," (with J. Greory Sidak), Southern California Law Review, July 1995.

"The Unregulated Infobahn," (with J. Gregory Sidak), Policy (New Zealand), Winter 1995.

"Managing the Transition to Deregulation in Telecommunications," in Steven Globerman, W.T. Stanbury, and Thomas A. Wilson (eds.), The Future of Telecommunications Policy in Canada. University of British Columbia and the University of Toronto, 1995.

"Productivity Growth in the Telephone Industry Since 1984," (with Jonathan Galst) in Patrick Harker (ed.), The Service Productivity and Quality Challenge, Dodrecht: Kluwer Academic Publishers, 1995, Chapter 14.

"Cable Television: Reinventing Regulation," The Brookings Review, Winter 1994, pp. 12-15.

"Explaining Regulatory Policy" (with Clifford Winston), Brookings Papers on Economic Activity, Microeconomics, 1994, pp. 1-31.

"Pricing Issues in Telecommunications," Maine Policy Review, Vol. 3, No. 1, May 1994.

"Regulation and the "Rights" Revolution: Can (Should) We Rescue the New Deal?" Critical Review, Vol. 7 Nos. 2-3, 1993, pp. 193-204.

"Comment: Transactions Prices," Price Measurement and Their Uses, (Murray F. Foss, Marilyn E. Manser, and Allan H. Young, eds.), University of Chicago Press, 1993.

"Pollution Controls" in David R. Henderson (ed.), The Fortune Encyclopedia of Economics, New York: Warner Books, 1993.

"Relaxing the Regulatory Stranglehold on Communications," Regulation, Summer 1992, pp. 26-35.

"Regulating Communications: Creating Monopoly While Protecting Us From It," The Brookings Review, Summer 1992, Volume 10, No. 3, pp. 34-39.

"Policy Watch: Corporate Average Fuel Economy Standards," Journal of Economic Perspectives, Spring 1992, pp. 171-80.

"Why Is the Cost of Environmental Regulation So High?" Center for the Study of American Business. St. Louis: Washington University, Policy Study No. 110, February 1992.

"Liberalization Without Deregulation: Telecommunications Policy During the 1980s," Contemporary Policy Issues, October 1991.

"Halfway Home: U.S. Telecommunications (De)Regulation in the 1970s and 1980s," in Jack High (ed.), Regulation: Economic Theory and History. Ann Arbor: The University of Michigan Press, 1991.

"Efficiency and Productivity," in Barry G. Cole (ed.), After the Breakup: Assessing the New Post-AT&T Divestiture Era. New York: Columbia University Press, 1991.

"The Politics of Energy: New Fuel Economy Standards?" (with John D. Graham), The American Enterprise, March/April 1991.

"The Clean Air Act at Twenty," Journal of Regulation and Social Costs, September 1990.

"Fragmentation of the Telephone Network" in Paula Newberg (ed.), New Directions in Telecommunications Policy. Durham, NC: Duke University Press, 1989.

"The Effect of Fuel Economy Standards on Automobile Safety," (with John D. Graham), Journal of Law and Economics, April 1989.

"Surprises from Telephone Deregulation and the AT&T Divestiture," American Economic Review, May 1988, pp. 323-327.

"The Regional Shift of U.S. Economic Activity" in Robert E. Litan, et al., American Living Standards, Washington, DC: The Brookings Institution, 1988.

"Deregulation and Divestiture in the U.S. Telecommunications Sector" in Economic Deregulation: Promise and Performance. Proceedings of the 1987 Donald S. MacNaughton Symposium, Syracuse University, 1988.

"Whatever Happened to Deregulation?" in David Boaz (ed.), Assessing the Reagan Years. Washington, DC: The CATO Institute, 1988.

"Regulatory Reform: Are We Ready for the Next Phase?" in The Brookings Review, The Brookings Institution, Winter 1988/89.

"Telecommunications Policy in the Reagan Era," Regulation, Washington, DC: American Enterprise Institute, 1988, Number 3, pp. 18-19.

"A Sectoral Perspective: Steel" in Robert M. Stern, et.al. (eds.), Perspectives on a U.S.-Canadian Free Trade Agreement, Washington, DC: The Brookings Institution, 1987.

"The Effects of U.S. Trade Protection for Autos and Steel," Brookings Papers on Economic Activity, 1987:2, The Brookings Institution.

"Has the AT&T Breakup Raised Telephone Rates?" in The Brookings Review, Winter 1987.

"Public Policy and the Private Auto," (with Theodore E. Keeler) in Gordon, et.al. (eds.), Energy: Markets and Regulation, Essays in Honor of M.A. Adelman. Cambridge, MA: MIT Press, 1986

"Materials Economics, Policy, and Management: An Overview," with Michael B. Bever, in Encyclopedia of Materials Science and Engineering, Pergamon Press, 1986.

"Metals Industries: International Structure," in Encyclopedia of Materials Science and Engineering, Pergamon Press, 1986.

"The Steel Industry in Transition," Materials and Society, Pergamon Journals Ltd., Vol. 10, No. 2, 1986.

"The Public Interest in Metals Policy," in David A. Gulley and Paul Duby (eds.), The Changing World Metals Industries. New York: Gordon and Breach, 1986.

"Economic Rents as a Barrier to Deregulation," The CATO Journal, Spring/Summer 1986.

"The Transformation of U.S. Manufacturing," Industrial Relations, Spring 1986. "Investment and Productivity Growth in the Steel Industry: Some Implications for Industrial Policy," in Walter H. Goldberg, Ailing Steel: The Transoceanic Quarrel, Gower, 1986.

"The EC-US Steel Trade Crisis," in Loukas Tsoukalis (ed.), Europe, America, and the World Economy, Oxford: Basil Blackwell, 1986.

"Why Should We Regulate Fuel Economy at All?" in The Brookings Review, Spring 1985.

"An Acid Test for Congress," Regulation, September/December 1984.

"Import Quotas and the Automobile Industry: The Costs of Protectionism," The Brookings Review, Summer 1984.

"Automobile Safety Regulation and Offsetting Behavior: Some New Empirical Estimates," (with John D. Graham), American Economic Review, Papers and Proceedings, May 1984.

"The Political Economy of Clean Air: Practical Constraints on White House Review," in V. Kerry Smith, Environmental Policy Under Reagan's Executive Order: The Role of Benefit-Cost Analysis, University of North Carolina Press, 1984.

"The Marketplace: Economic Implications of Divestiture," (with Bruce M. Owen), in Harry M. Shooshan III, Discounting Bell: The Impact of the AT&T Divestiture, Pergamon Press, 1984.

"Environmental Policy in the Reagan Administration," (with Paul R. Portney), in Paul R. Portney (ed.), Natural Resources and the Environment: The Reagan Approach, The Urban Institute and Resources for the Future, 1984.

"The Emerging Competition in the U.S. Telecommunications Market" in New Opportunities for Entrepreneurship, The Kiel Institute, 1984.

"Deregulation: The U.S. Experience," Zeitschrift fur die gesamte Staatswissenschaft, October 1983, pp. 419 - 434.

Review of John Zysman and Laura Tyson, American Industry in International Competition, Science, Vol. 222, October 21, 1983.

"Air Pollution, Environmentalists, and Coal Lobby," in Roger G. Noll and Bruce M. Owen (eds.), The Political Economy of Deregulation, American Enterprise Institute, 1983.

"The Use of Environmental Policy to Reduce Economic Growth in the Sun Belt: The Role of Electric-Utility Rates" in Michael A. Crew (ed.), Regulatory Reform and Public Utilities, Lexington Books, 1982.

"The Cost of Automobile Safety and Emissions Regulation to the Consumer: Some Preliminary Results," (with Theodore E. Keeler and Lester B. Lave), American Economic Review, May 1982.

"Environmental Policy," Regulation, March/April 1982.

"Has Reagan Dropped the Ball?" in Regulation, November/December 1981.

"The Use of Cost-Benefit Analysis in Regulatory Decision-Making," Annals New York Academy of Sciences, 1981. "The Deregulation of Cable Television," (with Stanley M. Besen), Law and Contemporary Problems, Duke University School of Law, Vol. 44, No. 1, Winter 1981.

"The Impossibility of Finding a Mechanism to Ration Health Care Resources Efficiently" in A New Approach to the Economics of Health Care, Mancur Olson (ed.), American Enterprise Institute for Public Policy Research, 1981.

"Pollution Controls and Productivity Growth in Basic Industries" in Productivity Measurement in Regulated Industries, Academic Press, 1981.

"Where is the Public Interest in Broadcasting Regulation?" in Regulation and the Future Economic Environment-Air to Ground, Charles F. Phillips, Jr. (ed.), December 1980.

"The Environmental Protection Agency," (On Saving the Kingdom: Advice for the President-Elect), Regulation, November/December 1980.

"Steel Imports: Dumping or Competition?" in Regulation, July/August 1980.

"Regulation and Productivity Growth" in Proceedings: Conference on Productivity, Federal Reserve Bank of Boston, Martha's Vineyard, June 1980.

"The Prospects for Regulatory Reform," Government Regulation: New Perspectives, Andrew Blair, ed., Pittsburgh: University of Pittsburgh, 1980.

"The Economics of the Current Steel Crisis in OECD Member Countries" in Steel in the 80's, Organisation for Economic Co-operation and Development, Paris, 1980.

"Environmental Control Is Out of Control," Chemical and Engineering News, Vol. 57, April 23, 1979.

"Paying for Government Policy Through the Price Level" in Clarence C. Walton (ed.), Inflation and National Survival, 1979.

"Is Government Regulation Crippling Business?" in Saturday Review, January 20, 1979.

"Federal Government Initiatives to Reduce the Price Level," Brookings Papers on Economic Activity, 1978:2.

"Competition and 'Dumping' in the U.S. Steel Market," Challenge, July/August 1978.

"Regulation of Television Broadcasting: How Costly is the 'Public Interest'?" in Regulation, January/February 1978.

"Placing a Value on the Electromagnetic Spectrum: A Suggested Approach for FCC Decision-Making," Proceedings of the Conference on Telecommunications Policy Research, Airlie House, 1977.

"Theoretical Issues in the Regulation of Communications Common Carriage" in Rate of Return Regulation, FCC Future Planning Conference, July 1976.

"The Postwar Performance of the Motion Picture Industry," The Antitrust Bulletin, Spring 1975.

"An Econometric Model of the Low-Skill Labor Market," (with C.D. MacRae and Lorene Y.L. Yap), The Journal of Human Resources, Winter 1975.

"The Economic Case for a Fourth Commercial Television Network," Public Policy, Harvard University Press, Fall 1974.

"The Profitability of Cable Television: An Analysis of Acquisition Prices," The Journal of Business, University of Chicago, October 1974.

"A Reexamination of the Prophecy of Doom for Cable Television," (with Lionel L. Fray), The Bell Journal of Economics and Management Science, Spring 1974.

"Monopoly," The Dictionary of American History, Charles Scribner's & Sons, 1973.

"FCC Regulation, Monopsony, and Network Television Program Costs," The Bell Journal of Economics and Management Science, Autumn 1972.

Study Guide for Basic Economics (with R.S. Eckaus), Little, Brown and Company, 1972.

Contemporary Issues in Economics: Selected Readings (with R.S. Eckaus), Little, Brown and Company, 1972.

"Economic Subsidies in the Urban Ghetto," (with C.D. MacRae), Social Science Quarterly, December 1971.

"The Economic Effect of Television-Network Program 'Ownership'," The Journal of Law and Economics, Vol. XIV, October 1971.

"The Decline of the Franchised Dealer in the Automobile Industry," The Journal of Business, University of Chicago, January 1970.

"Motor Vehicle Repair, Repair-Parts Production, and the Franchised Vehicle Dealer," Hearings: The Automobile Industry, U.S. Senate Antitrust Subcommittee of the Committee on the Judiciary, 1969.

"Vertical Integration and the Market for Repair Parts in the United States Automobile Industry," The Journal of Industrial Economics, Oxford: Basil Blackwell. July 1968.

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Professor of Economics, University of California, Berkeley, 1991-
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PREVIOUS POSITIONS:

Chief Economist, Federal Communications Commission, Jan. 1996-June 1997.
Associate Professor, University of California, Berkeley, 1989-91.
National Fellow, Hoover Institution, Stanford University, 1988-9.
Visiting Assistant Professor, University of California, Berkeley, 1986-8.
Principal Member, Technical Staff, GTE Laboratories, 1985-6.
Senior Member, Technical Staff, GTE Laboratories, 1984-85.
Assistant Professor of Economics, MIT, 1980-84.
Instructor, MIT, 1979-80.
Visiting Assistant Professor, University of California, San Diego, 1983.

EDUCATION:

D.Phil., economics, Oxford University, 1981.
Thesis title, "Prices as Signals of Quality."
Advisors: J.A. Mirrlees and J.E. Stiglitz.
M.Sc., mathematics, Oxford University, 1976.
Advisors: M.F. Atiyah and P.M. Neumann.
B.A., mathematics, First Class Honors, Oxford University, 1975.

TEACHING EXPERIENCE:

Oxford University (tutorials), Massachusetts Institute of Technology, University of California at Berkeley and at San Diego. Taught courses including graduate and undergraduate industrial organization, regulation and antitrust, competitive strategy, microeconomics, statistical decision theory, and game theory.

Joseph Farrell January 14, 1999

PUBLISHED AND FORTHCOMING RESEARCH PAPERS:

- "Standardization, Compatibility and Innovation," *Rand Journal of Economics* **16** (Spring 1985) 70-83 (with G. Saloner). Reprinted in *The Economics of Information*, Steven Lippman and David K. Levine, eds., International Library of Critical Writings in Economics series, Cheltenham, UK: Edward Elgar Publishing.
- "Owner-Consumers and Efficiency," *Economics Letters* **19** (1985) 303-306.
- "How Effective is Potential Competition?" *Economics Letters* **20** (1986) 67-70.
- "Standardization and Variety," *Economics Letters* **20** (1986) 71-74 (with G. Saloner).
- "Voluntary Disclosure: Robustness of the Unraveling Result," in *Antitrust and Regulation*, R. Grieson, ed., Lexington Books (1986), 91-103.
- "A Note on Inertia in Market Share," *Economics Letters* **21** (1986) 73-75.
- "Moral Hazard as an Entry Barrier," *Rand Journal of Economics* **17** (1986), 440-449.
- "Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation," *American Economic Review* **76** (December 1986), 940-955 (with G. Saloner).
- "Experience Rating and Premium Risk," *Economics Letters* **21** (1986) 311-314.
- "Cheap Talk, Coordination and Entry," *Rand Journal of Economics* **18** (1987), 34-39.
- "Rigidity Versus License," *American Economic Review* **77** (March 1987), 195-197.
- "Competition, Compatibility and Standards," pages 1-18 in *Product Standardization and Competitive Strategy*, H. L. Gabel, ed., North-Holland, 1987 (with G. Saloner).
- "Competition with Lock-In," pages 353-362 in *Telecommunications Demand Modeling: An Integrated View*, A. de Fontenay, M. Shugard and D. Sibley (eds.), North-Holland, 1990.
- "Partnerships," *Quarterly Journal of Economics* **103** (May 1988), 279-297 (with S. Scotchmer).
- "Information and the Coase Theorem," *Journal of Economic Perspectives* **1** (1987), 113-129. Reprinted (in part) in S. Baker and C. Elliott, eds., *Economics of the Public Sector: Readings and Commentary*, Lexington, Mass: Heath, 1989.

- "Dynamic Competition with Switching Costs," *Rand Journal of Economics* **19** (Spring 1988), 123-137 (with C. Shapiro)
- "Coordination Through Committees and Markets," *Rand Journal of Economics* **19** (Summer 1988) 235-252 (with G. Saloner).
- "Communication, Coordination, and Nash Equilibrium," *Economics Letters* **27** (1988) 209-214 (see subsequent *Erratum* for correction of misprints).
- "Cheap Talk Can Matter in Bargaining," *Journal of Economic Theory* **47** (1989), 221-237 (with R. Gibbons). Reprinted in *Bargaining with Incomplete Information*, P. Linhart, R. Radner, and M. Satterthwaite, eds., Academic Press, 1992.
- "Second-Sourcing as a Commitment: Monopoly Incentives to Attract Competition," *Quarterly Journal of Economics* **103** (November 1988), 673-694 (with N.T. Gallini).
- "Optimal Contracts with Lock-In," *American Economic Review* **79** (March 1989) 51-68 (with C. Shapiro).
- "Competition Between and Within Teams: The Lifeboat Principle," *Economics Letters* **29** (1989), 205-208 (with E. Lander).
- "Evolutionary Stability in the Repeated Prisoner's Dilemma," *Theoretical Population Biology* **36** (October 1989), 161-166 (with R. Ware).
- "Renegotiation-Proof Equilibrium: Reply," *Journal of Economic Theory* **49** (December 1989), 376-378 (with E. Maskin).
- "Cheap Talk with Two Audiences," *American Economic Review* **79** (December 1989), 1214-1223 (with R. Gibbons).
- "Horizontal Mergers: An Equilibrium Analysis," *American Economic Review* **80** (March 1990), 107-126 (with C. Shapiro). Reprinted in *Takeovers Volume I*, A. Cosh and A. Hughes, eds., International Library of Management. To be reprinted in *Applied Industrial Economics*, L. Philips, ed., Cambridge University Press.
- "Renegotiation in Repeated Games," *Games and Economic Behavior* **1** (December 1989), 327-360 (with E. Maskin). Reprinted in *International Library of Critical Writings in Economics: Recent Developments in Game Theory*. Cheltenham (UK): Edward Elgar.
- "Asset Ownership and Market Structure in Oligopoly," *Rand Journal of Economics* **21**

- (Summer 1990), 275-292 (with C. Shapiro).
- "Decentralization, Duplication, and Delay," *Journal of Political Economy* **98** (August 1990), 803-826 (with P. Bolton).
- "One-Sided Patience with One-Sided Communication Does Not Justify Stackelberg Equilibrium," *Games and Economic Behavior* **2** (1990), 299-303 (with E. Dekel).
- "Horizontal Mergers and Antitrust Policy: Reply," *American Economic Review* **81**, September 1991, 1007-1011 (with C. Shapiro).
- "The Role of the ITU in Standardization: Pre-Eminence, Impotence, or Rubber Stamp?" *Telecommunications Policy*, August 1991, 311-321 (with S.M. Besen).
- "Converters, Compatibility and the Control of Interfaces", *Journal of Industrial Economics* **40**, March 1992, 9-36 (with G. Saloner).
- "Standard Setting in High-Definition Television," *Brookings Papers on Economic Activity: Microeconomics*, 1992, 1-93 (with C. Shapiro).
- "The Dynamics of Bandwagons," in *Problems of Coordination in Economic Activity*, edited by J. W. Friedman: Kluwer, 1993. (with C. Shapiro).
- "Meaning and Credibility in Cheap-Talk Games," *Games and Economic Behavior* **5** (October 1993), 514-531. Reprinted in *Mathematical Models in Economics*, M. Bacharach and M. Dempster, eds., Oxford University Press, 1997.
- "Irrational Behavior in the AT&T Investment Game," *Economics Letters*, **45:4** (August 1994), 471-474 (with S. Scotchmer).
- "Cheap Talk about Specific Investments" *Journal of Law, Economics, and Organization*, **11:2** (1995), (with R. Gibbons).
- "The Vertical Structure of Industry: Systems Competition versus Component Competition" (with H. Monroe and G. Saloner), *Journal of Economics and Management Strategy*, **7:2** (Summer 1998), 143-182.
- "Renegotiation in the Repeated Amnesty Dilemma, with Economic Applications", in *Advances in Business Applications of Game Theory*, ed. K. Chatterjee and W. Samuelson, forthcoming (with G. Weizsäcker).

"The Effects of Antitrust and Intellectual Property Law on Compatibility and Innovation," *Antitrust Bulletin*, Fall/Winter 1998, forthcoming (with M.L. Katz).

OTHER PROFESSIONAL PUBLICATIONS

"Economic Issues in Standardization," in *Telecommunications and Equity: Policy Research Issues*, J. Miller, ed., North-Holland (1986), 165-178 (with G. Saloner).

"Puzzles: Sylvia, Ice Cream, and More," *Journal of Economic Perspectives*, 2, Summer 1988, 175-182.

"Standardization and Intellectual Property," *Jurimetrics Journal* 30 (1), Fall 1989, 35-50.

"The Economics of Standardization: A Guide for Non-Economists," in J.L. Berg and H. Schumny, eds., *An Analysis of the Information Technology Standardization Process: Proceedings of the International Symposium on Information Technology Standardization, INSITS*. Amsterdam: North-Holland, 1990, pp 189-198.

Book Review: *Changing the Rules: Technological Change, International Competition, and Regulation in Telecommunications*, ed. R. Crandall and K. Flamm. *Journal of Economic Literature* 29 (September 1991), 1204-1205.

Discussion of article by Franklin M. Fisher, *Brookings Papers on Economic Activity: Microeconomics*, 1991, 231-240.

"Choosing How to Compete: Strategy and Tactics in Standardization" (with S. Besen); *Journal of Economic Perspectives*, 8 (Spring 1994), 117-131.

"Some Arguments for Weaker Intellectual Property Protection in Network Industries" in *Standards Policy and Information Infrastructure*, edited by Brian Kahin (MIT Press), 368-377, and in *StandardView* 3:2 (June 1995), 46-49.

"The Economic Role of Standards," (Box) in *The Changing Nature of Telecommunications/Information Infrastructure*, National Academy Press, 1995.

"Talk is Cheap," *American Economic Review* 85:2, May 1995, 186-190.

"Brief Amicus Curiae" to the US Supreme Court in *Lotus v. Borland*, December 1995. Written (pro bono publico) with G. Woroch; also signed by 13 other economists.

"Harnesses and Muzzles: Greed as Engine and Threat in the Standards Process,"
StandardView 4:1 (March 1996), 29-31; available at:
<http://www.acm.org/pubs/articles/journals/standardview/1996-4-1/p29-farrell/p29-farrell.pdf>

"Cheap Talk," *Journal of Economic Perspectives* 10:3, Summer 1996, 103-118 (with M. Rabin).

"Creating Local Competition," *Federal Communications Law Journal* 49:1, November 1996, 201-215.

"Prospects for Deregulation in Telecommunications," *Industrial and Corporate Change*, 6:4 (December 1997), 719-740.

Testimony on "Competition in the digital age" US Senate Judiciary Committee, November 1997.

"Public Policy and Private Investment in Advanced Telecommunications Infrastructure," *IEEE Communications Magazine*, 36:7, July 1998, pp. 87-92 (with M.L. Katz).

"Cheap Talk and Coordination", *The New Palgrave Dictionary of Economics and the Law*. McMillan, 1998, forthcoming.

Discussion of article by Church and Ware, in *Competition Policy and Intellectual Property Rights in the Knowledge-Based Economy*, R. Anderson and N.T. Gallini, editors. University of Calgary Press (Industry Canada series), 1998.

SOLICITED PAPERS UNDER PREPARATION (tentative titles)

"Competition with Network Effects or Lock-In", for Volume 3 of *Handbook of Industrial Organization* (with P. Klemperer).

"Telecommunications", for Volume 3 of *Handbook of Industrial Organization* (with R. Noll).

OTHER UNPUBLISHED PAPERS

"Choosing the Rules for Formal Standardization" (second revise-and-resubmit, *Rand Journal*).

"Renegotiation in Repeated Oligopoly Games"

"Competition and Productive Efficiency" (draft) (with S. Borenstein).

"Do Investors Forecast Fat Firms? Diagnosing Profit Dissipation from Stock Market Values of Gold Mining Firms" (with S. Borenstein).

PROFESSIONAL ACTIVITIES:

President, Industrial Organization Society, 1996.

North American Editor (jointly with S. Borenstein), *Journal of Industrial Economics*, since 1995. See <http://www.haas.berkeley.edu/~jindex>

Refereeing for *American Economic Review*, *Bell Journal of Economics*, *Econometrica*, *Economic Inquiry*, *Economica*, *European Journal of Operational Research*, *Games and Economic Behavior*, *Industrial and Corporate Change*, *Information Economics and Policy*, *International Economic Review*, *International Journal of Game Theory*, *International Journal of Industrial Organization*, *Journal of Economic Dynamics and Control*, *Journal of Economic Theory*, *Journal of Economics and Business*, *Journal of Economics and Management Strategy*, *Journal of Law and Economics*, *Journal of Law, Economics and Organization*, *Journal of Macroeconomics*, *Journal of Money, Credit, and Banking*, *Journal of Political Economy*, *Journal of Public Economics*, *Management Science*, *Mathematical Social Science*, *Oxford Economic Papers*, *Quarterly Journal of Economics*, *Quarterly Review of Economics and Business*, *Rand Journal of Economics*, *Review of Economic Studies*, *Theoretical Population Biology*, for Harvard University Press, MIT Press, Princeton University Press, for the Rand Corporation, the National Science Foundation, and for the UC Energy Research Group.

Affiliate, Berkeley Center for Law and Technology; Center for Regulatory Policy.

Academic Advisory Boards

Consortium on Telecommunications Policy
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Seminar Presentations at Barcelona, Boston University, Caltech, Calgary, Cambridge University, Columbia, University of Chicago, Harvard, Georgetown (Law School), George Washington University, LSE, MIT, Michigan, NBER, Northwestern, Norwegian School of Management, Oslo University, Oxford, Princeton, Santa Fe Institute, Stanford, Tel Aviv, Arizona, British Columbia, University of California (Berkeley, Davis, Los Angeles, San Diego, Santa Barbara, Santa Cruz), Iowa, New University of Lisbon, USC, Toronto, Toulouse, Washington, US Department of Justice, Federal Trade Commission, Canadian Bureau of Competition Policy, National Association of Attorneys General, National Research Council, OECD, World Bank, and at numerous conferences.

Television Interview, "Deep Thinking about Standards," on "High Technology with Killen and Class," cable networks, Spring 1989.

Organized the GTE Laboratories Economics Symposium, August 1985.

Organizing Committee, Fourteenth Annual Telecommunications Policy Research Conference, April 1986.

Program Committee, Econometric Society, June 1992.

Speaker, discussant, session chair at numerous conferences.

Reviewer, U. S. Office of Technology Assessment:

Joseph Farrell January 14, 1999

"Computer Software and Intellectual Property", *Finding a Balance*, 1992.

Global Standards: Building Blocks for the Future, March 1992.

Reviewer, National Academy of Sciences/National Research Council.

Witness, US Senate Judiciary Committee, hearing on "Competition in the digital age", November 4, 1997. Provided written (see above) and oral testimony.

University and departmental administrative service including service as Chair of the Graduate Committee, membership of the Personnel Committee and Undergraduate Committee, promotion and tenure committees, and *ad hoc* committees.

Consultant for US Government and private parties.

HONORS, SCHOLARSHIPS AND GRANTS

Open Scholarship in Mathematics (undergraduate) 1972-1975.

College Book Prize, 1974.

University Prize in mathematics, 1975.

Taberdar Senior Scholarship [awarded to one to two graduate students in all subjects], 1975-76.

Science Research Council Studentship, 1975-78.

Amphlett Senior Scholarship [one of six in all subjects], 1976-78.

Hulme Senior Scholarship [one of three in all subjects], 1978-79.

University Prize for best economics master's thesis, 1979.

Principal Investigator, National Science Foundation grant, "Economics of Compatibility Standards and Lock-In," 1987-89.

National Fellow, Hoover Institution, Stanford University, 1988-9.

Co-Principal Investigator (with C. Shapiro), NSF grant, "The Evolution of Network Industries," 1989-91.

Hewlett Fund grant, Institute of International Studies, Berkeley, 1990-91.

Co-Principal Investigator (with C. Shapiro), NSF grant, "Technology Transitions with Network Externalities," 1992-94.

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EDUCATION

Massachusetts Institute of Technology, Ph.D., September, 1986. Thesis Title: "Essays in Theoretical Industrial Organization."

Princeton University, A.B., summa cum laude, June, 1981, major in Economics.

EMPLOYMENT

Professor of Economics and Strategy, Graduate School of Business, The University of Chicago, September 1995 - present.

Research Fellow, National Bureau of Economic Research, October 1994 - present.

Associate Professor of Economics and Strategy, Graduate School of Business, The University of Chicago, April 1995 - August 1995.

Associate Professor of Business Economics, Graduate School of Business, The University of Chicago, September 1990 - April 1995.

Visiting Associate Professor of Management and Strategy, J. L. Kellogg Graduate School of Management, Northwestern University, September 1994 - March 1995.

Assistant Professor of Business Economics, Graduate School of Business, The University of Chicago, September 1986 - August 1990.

Full-time Consultant, American Telephone and Telegraph Company, Microeconomic Analysis Group, September 1981 - July 1982.

OTHER POSITIONS

Editor, *Journal of Business*, July 1995 - present.

Associate Editor, *Journal of Industrial Economics*, August 1995 - present.

FELLOWSHIPS AND GRANTS

John M. Olin Visiting Fellow in Law and Economics, The Law School, University of Chicago, 1990 - 1991.

IBM Corporation Scholar, University of Chicago, Graduate School of Business 1989 - 1990.

National Science Foundation Research Grant, "Bankruptcy and the Costs of Financial Distress," 1989 - 1991.

Visiting Scholar, CEPREMAP, Paris, France, April 1988.

Alfred P. Sloan Foundation Doctoral Dissertation Fellowship, 1985 - 1986.

National Science Foundation Graduate Fellowship, 1982 - 1985.

ACADEMIC PUBLICATIONS

BOOK:

Game Theory and the Law, (with Douglas Baird and Randal Picker), Harvard University Press, November 1994.

PUBLISHED AND FORTHCOMING PAPERS

"Agreement Under Section 1 of the Sherman Act," (with Andrew Rosenfield), November, 1997 (*forthcoming The New Palgrave Dictionary of Economics and the Law*).

"Unravelling and Disclosure Laws," August 1997 (*forthcoming The New Palgrave Dictionary of Economics and the Law*).

"Communication Among Competitors: Game Theory and Antitrust," (with Dennis Carlton and Andrew Rosenfield), Spring, 1997 *George Mason Law Review*, vol. 5.

"Multimarket Contact and Tacit Collusion with Imperfect Monitoring," (with Barbara

McCutcheon), December, 1992, revised, September, 1993, (under review, *Rand Journal of Economics*).

"Settlement Escrows," (with Geoffrey Miller), *Journal of Legal Studies*, 24 January, 1995, 87-122.

"Internal versus External Capital Markets," (with David S. Scharfstein and Jeremy C. Stein), *Quarterly Journal of Economics*, 109, November, 1994, 1211-1230.

"Anatomy of Financial Distress: An Examination of Junk-Bond Issuers," (with Paul Asquith and David Scharfstein), *Quarterly Journal of Economics*, 109, August 1994, 625-658.

"Asymmetric Information, Uncertainty, and Selection Bias In Litigation," 1993, *The University of Chicago Law School Roundtable*, Vol. 1993 (inaugural edition), 75-94.

"Game Shows and Economic Behavior: Risk Taking on 'Card Sharks'," *Quarterly Journal of Economics*, 108, May, 1993, 507-521.

"Search With Learning from Prices: Does Increased Inflationary Uncertainty Lead to Higher Markups?" (with Roland Benabou), *Review of Economic Studies*, 60, January, 1993, 69-94.

"Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules," (with Ian Ayres), 101, *Yale Law Journal*, January, 1992, 729-773.

"A Theory of Workouts and the Effects of Reorganization Law," (with David Scharfstein), *Journal of Finance*, 46, September, 1991, 1189-1221.

"Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules," (with Ian Ayres), *Yale Law Journal*, 99, November, 1989, 87-130. Excerpts appear in, Richard Craswell and Alan Schwartz, editors, *Foundations of Contract Law*, Oxford University Press, 1994.

"Market Power and Mergers in Durable Goods Industries," (with Dennis Carlton), *Journal of Law and Economics*, 32, October 1989, S203-S226.

"Simultaneous Signaling to the Capital and Product Markets," (with Robert Gibbons and David Scharfstein), *Rand Journal of Economics*, 19, Summer 1988, 173-190.

WORKING PAPERS

"Tacit Collusion with Immediate Responses: The Role of Asymmetries," April, 1993, revised, December, 1994 (under review, *Journal of Political Economy*).

"Internal Capital Markets: The Enforcement and Efficiency of Exclusive Capital Supply Contracts," December, 1994, formerly, "The Organization of Capital Market Transactions: Exclusive Contracts and Vertical Integration Under Asymmetric Information," June, 1986.

"Externalities, Delay, and Coalition Formation in Multilateral Bargaining," August, 1994, originally titled, "Inefficiency in Three-Person Bargaining," June 1989.

"Bankruptcy, Information Transmission and the Allocation of Control," (with Randal Picker), February, 1992, revised, April, 1994.

"Capital Structure Signalling in Distressed Debt Workouts," November 1990, revised, September, 1993.

"Internal Capital Markets," March, 1995.

"Revenue and Efficiency Differences Between Sequential and Simultaneous Auctions with Limited Information," October, 1995.

"Coordination, Dispute Resolution, and the Scope of the Firm," April, 1996.

"Price Fixing Under the Sherman Act: The New Learning from Game Theory," with Andrew Rosenfield), May, 1996.

"The Value-Maximizing Board," (with Steven Kaplan), December, 1996.

CASE STUDIES

"The Feature Animation Industry in 1995: Challenging Disney's Supremacy," (with Stacey Roth), March, 1995, revised, September, 1995.

"Selling the Radio Spectrum: The 30 MHz MTA PCS Auction," April 1995.

TEACHING EXPERIENCE

Microeconomics (M.B.A.)

Applied Microeconomics (M.B.A./Ph.D.)

Industrial Organization (Ph.D.)

Financial Markets and Institutions (M.B.A.)

Competitive Strategy (M.B.A.)

Corporation Law (J.D.)

Business Policy (M.B.A.)

Management of Organizations (M.B.A. Kellogg)

Seminar on Advanced Antitrust (J.D.)

Advanced Competitive Strategy: Game Theory in Practice (M.B.A.)

ADDITIONAL EXPERIENCE

Analysis of antitrust and strategic issues in mergers, joint ventures, and monopolization litigation with Lexecon Inc.

Consultant of a variety of strategic management issues including incentive compensation, supplier relationships, and acquisitions.

Auction design and bidding adviser to WirelessCo. (joint venture of Sprint, TCI, Cox Cable, and Comcast) and AirLink L.L.C. in FCC spectrum auctions.

Lost profit and valuation analysis in corporate litigation.

Testimony before the Federal Trade Commission on Consumer Protection and Antitrust in Cyberspace.

CASES IN WHICH I PROVIDED DEPOSITIONS OR TRIAL TESTIMONY:

Stratosphere Corporation, and Stratosphere Gaming Corp., United States Bankruptcy Court, District of Nevada, CN BK-S 97-20554-GWZ and BK-S 97-20555-GWZ, Deposition and trial testimony, in a case where the central economic issue was the structure of a credit enhancement to a loan agreement, February 1998.

Trio Holdings et. al. v. Columbus Investment et. al. Cook County Circuit Court, Deposition and trial testimony on economic incentives in partnership and damages from self-dealing, for defendant, November 1997.

Ellen Steffen et. al. v. Playmobil USA, Inc., United States District Court, Eastern District of New York, CV 95 2896, CV 96 3937, CV 96 3938, Deposition on economic issues in a vertical price fixing case, for defendant, May, 1997.

Hi-Lite Products v. American Home Products, United States District Court, Northern District of Illinois, Case 92 C 0384, Deposition and trial testimony on damages a contract breach case, for plaintiff, January 1996.

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EDUCATION

B.S., CORNELL UNIVERSITY, Electrical Engineering (with honors), 1966
M.S., CORNELL UNIVERSITY, Electrical Engineering, 1967
M.A., STANFORD UNIVERSITY, Economics, 1975
Ph.D., STANFORD UNIVERSITY, Engineering-Economic Systems, 1976

PRESENT POSITIONS

LECG
Principal
Member, Board of Directors

UNIVERSITY OF CALIFORNIA, BERKELEY, 1983- present
Professor of Economics

UNIVERSITY OF CALIFORNIA, BERKELEY, 1997-present
Adjunct Professor of Business Administration

PROFESSIONAL EXPERIENCE

U.S. DEPARTMENT OF JUSTICE, Antitrust Division, 1993-1995
Deputy Assistant Attorney General for Economics

UNIVERSITY OF CALIFORNIA, BERKELEY, 1990-1993
Adjunct Professor of Business Administration

UNIVERSITY OF CALIFORNIA ENERGY INSTITUTE, 1984-1993
Director

STANFORD UNIVERSITY, 1982-1983
Associate Professor of Engineering-Economic Systems (with tenure)

UNIVERSITY OF CALIFORNIA, BERKELEY, 1979-1983
Associate Professor of Economics (with tenure)

UNIVERSITY OF CALIFORNIA, BERKELEY, 1976-1979
Assistant Professor of Economics

STANFORD UNIVERSITY, 1975-1976
Research Associate, Department of Economics and Institute for Energy Studies

U.S. NAVY, 1967-1971
Lieutenant, Senior Grade

FELLOWSHIPS AND AWARDS

Visiting Fellow, Churchill College, University of Cambridge, 1979

Visiting Fellow, Nuffield College, University of Oxford, 1979

Fulbright Scholar, South America, 1989

Recipient of the 1st Annual Berkeley Center for Law and Technology Award for Contributions to the Development of Law and Public Policy, 1996

Listed in *Who's Who*

PROFESSIONAL ACTIVITIES

President, *Industrial Organization Society*, 1994-1995

Associate Editor, *Journal of Economic Theory*, 1983-1989

Associate Editor, *Journal of Industrial Economics*, 1990-1993

Associate Editor, *Review of Industrial Organization*, 1990-1993

Vice-Chair, American Bar Association Antitrust Economics Committee, 1993-1995

Co-Director, Program on Workable Energy Regulation, 1990-1993

Review Panel, National Science Foundation, Economics Program, 1985

Review Panel, National Science Foundation, Regulation Program, 1985-1986

Advisor to U.S. Department of Energy, Energy Assessment Panel on Energy Security, 1992

Member of Advisory Board, California Institute for Energy Efficiency, 1992-3

Member of the Advisory Board, Center for Research in Management, University of California at Berkeley, 1998-present
Conference Organizer: European Summer Symposium in Economic Theory, Gerzensee, 1998; Post-Chicago Economics Conference, Washington, D.C., May 26-27, 1994; International Comparisons of Electricity Regulation, Toulouse, May 1993; Economics of Energy Conservation, Berkeley, June 1992; Telecommunications Policy Research Conference, 1988, 1989; Developments in Electricity Regulation, Berkeley, June 1987

Session Organizer: 1994 Meetings of the American Economic Association; 1987 Meetings of the Econometrics Society; 1984 Meetings of the American Economic Association; 1983 Meetings of ORSA/TIMS Associations.

Referee for: *American Economic Review*, *Econometrica*, *International Economic Review*, *Journal of Political Economy*, *Quarterly Journal of Economics*, *Rand Journal*, *Review of Economic Studies*. Occasional referee for other journals

Member of American Economic Association, Econometric Society, Sigma Xi, Tau Beta Pi, Eta Kappa Nu.

Associate Member, American Bar Association, Antitrust Section

PUBLICATIONS

Articles

- 1) "Antitrust Policy for the Licensing of Intellectual Property: An International Comparison," forthcoming in the *International Journal of Technology Management*.
- 2) "Competition Policy," with Oliver Williamson, *The New Palgrave Dictionary of Law and Economics*, Macmillan, 1998.
- 3) "Antitrust Issues in the Licensing of Intellectual Property: The Nine No-No's Meet the Nineties," with Carl Shapiro, *Brookings Papers: Microeconomics*, 1997, pp. 283-336.
- 4) "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" with Severin Borenstein and A. Colin Cameron, *Quarterly Journal of Economics*, vol. 112, Issue 1, February 1997, pp. 305-339.
- 5) "An Economic Analysis of Unilateral Refusals to License Intellectual Property," with Carl Shapiro, *Proceedings of the National Academy of Sciences of the United States of America*, vol. 93, no. 23, November 12, 1996, pp. 12749-12755.
- 6) "The Use of Innovation Markets: A Reply to Hay, Rapp and Hoerner," with Steven Sunshine, *Antitrust Law Journal*, vol. 64, no. 1, Fall 1995, pp. 75-82.

- 7) "Defining the Intersection of Intellectual Property and the Antitrust Laws: The 1995 Antitrust Guidelines for the Licensing of Intellectual Property," *Antitrust*, vol. 9, issue 3, Summer, 1995.
- 8) "Regulating Complementary Products: A Comparative Institutional Analysis," with Michael Riordan, *Rand Journal of Economics*, vol. 26, no. 2, Summer, 1995, pp. 243-256.
- 9) "Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets," with Steven Sunshine, *Antitrust Law Journal*, vol. 63, no. 2, Winter 1995, pp. 569-602. Reprinted in Andrew I. Gavil (ed.), *An Antitrust Anthology*, Anderson Publishing, 1996.
- 10) "The Dynamic Efficiency of Regulatory Constitutions," with David Newbery, *Rand Journal of Economics*, vol. 25, no. 4, Winter, 1994, pp. 538-554.
- 11) "A Review and Analysis of Utility Conservation Incentive Programs," with Steven Stoft, *The Yale Journal on Regulation*, Winter, 1994, pp. 1-42.
- 12) "Coordination in the Wholesale Market: Where does it Work?" with Edward Kahn and Matthew White, *The Electricity Journal*, vol. 6, no. 8, October 1993, pp. 51-59.
- 13) "Uncle Sam at the Gas Pump: The Causes and Consequences of Gasoline Distribution Regulations," *Regulation*, vol. 16, no. 2, 1993, pp. 63-75.
- 14) "Product Line Rivalry with Brand Differentiation," with Carmen Matutes, *The Journal of Industrial Economics*, September, 1993, pp. 223-240.
- 15) "Alternative Entry Paths: The Build or Buy Decision," with David Newbery, *Journal of Economics, Management, and Strategy*, Spring, 1992, pp. 129-150.
- 16) "Introduction to Symposium on Compatibility: Incentives and Market Structure," *The Journal of Industrial Economics*, March 1992, pp. 1-8.
- 17) "Legal and Economic Issues in the Commercialization of New Technology," *Journal of Institutional and Theoretical Economics*, March 1991, pp. 155-181.
- 18) "Multiproduct Competition," with Carmen Matutes, *Annales d'Economie et de Statistique*, vol. 18, April/June 1990, pp. 151-163.
- 19) "Optimal Patent Length and Breadth," with C. Shapiro, *Rand Journal of Economics*, vol. 21, no. 1, Spring 1990, pp. 106-112.
- 20) "The Role of Potential Competition in Industrial Organization," *Journal of Economic Perspectives*, vol. 3, No. 3, Summer 1989, pp. 107-127. Reprinted in Bonanno, G. and D. Brandolini (eds.), *Industrial Structure in the New Industrial Economics*. Clarendon Press, Oxford, 1990, pp. 38-67.
- 21) "Investment and Coordination in Oligopolistic Industries," with M. Lieberman, *Rand Journal of Economics*, vol. 18, no. 1, Spring 1987, pp. 17-33.

- 22) "Comment on Levin, R., A. Klevorick, R. Nelson, and S. Winter, 'Appropriating the Returns from Industrial Research and Development,'" *Brookings Papers on Economic Activity*, vol. 3, 1987, pp. 821-824.
- 23) "Investing Under Regulatory Uncertainty: What to do When the Rules Change," with H. Chao and S. Peck, *Energy Systems and Policy*, vol. 9, no. 4, 1986, pp. 385-396.
- 24) "Efficient Pricing During Oil Supply Disruptions," with K. Mork, *Energy Journal*, vol. 7, no. 2, April 1986, pp. 51-68.
- 25) "Entry Deterrence and the Free Rider Problem," with X. Vives, *Review of Economic Studies*, vol. LIII(1), no. 172, January 1986, pp. 71-84.
- 26) "Competition with Lumpy Investment," with R. Harris, *Rand Journal of Economics*, vol. 15, no. 2, Summer 1984, pp. 197-212.
- 27) "Will Oil Markets Tighten Again? A Survey of Policies to Manage Possible Oil Supply Disruptions," with K. Mork, *Journal of Policy Modeling*, vol. 6, no. 1, 1984, pp. 111-142.
- 28) "Customer and Investor Evaluations of Power Technologies: Conflicts and Common Grounds," with H. Chao and S. Peck, *Public Utilities Fortnightly*, vol. 113, no. 9, April 26, 1984, pp. 36-41.
- 29) "Preemptive Patenting and the Persistence of Monopoly: Reply," with D. Newbery, *American Economic Review*, vol. 74, no. 1, March 1984, pp. 251-253.
- 30) "Uncertain Innovation and the Persistence of Monopoly: Comment," with D. Newbery, *American Economic Review*, vol. 74, no. 1, March 1984, pp. 238-242.
- 31) "Strategic Considerations in Invention and Innovation: The Case of Natural Resources," with P. Dasgupta and J. Stiglitz, *Econometrica*, vol. 51, no. 5, September 1983, pp. 1439-1448. Reprinted in Binmore, K. and P. Dasgupta (eds.), *Economic Organizations as Games*, Basil Blackwell.
- 32) "Preemption, Leapfrogging and Competition in Patent Races," with D. Fudenberg, J. Stiglitz, and J. Tirole, *European Economic Review*, vol. 22, no. 1, June 1983, pp. 3-32.
- 33) "Invention and Innovation Under Alternative Market Structures: The Case of Natural Resources," with P. Dasgupta and J. Stiglitz, *Review of Economic Studies*, vol. 49(4), no. 158, October 1982, pp. 567-582.
- 34) "Preemptive Patenting and the Persistence of Monopoly," with D. Newbery, *American Economic Review*, vol. 72, no. 2, June 1982, pp. 514-526.
- 35) "Investment Decisions with Economies of Scale and Learning," with R. Harris, *American Economic Review, Papers and Proceedings*, vol. 71, no. 2, May 1981, pp. 172-177.
- 36) "Reducing Uranium Resource Uncertainty: Is it Worth the Cost?" with R. Richels, *Resources and Energy*, vol. 3, 1981, pp. 13-37.

- 37) "Optimal Depletion of an Uncertain Stock," *Review of Economic Studies*, vol. 46, no. 142, January 1979, pp. 47-58.
- 38) "An Overview of the Economic Theory of Uncertainty and Its Implications for Energy Supply," with D. Newbery and J. Stiglitz, *Electric Power Research Institute Technical Report*, January 1978.
- 39) "Dominant Firm Pricing with Exhaustible Resources," *Bell Journal of Economics*, Autumn, vol. 9, no. 2, 1978, pp. 385-395.
- 40) "Factor Price Stabilization with Flexible Production," *Annals of Economic and Social Measurement*, vol. 5, no. 5, 1978, pp. 521-533.
- 41) "The Effects of Risk on Prices and Quantities of Energy Supplies," with J. Stiglitz, *Electric Power Research Institute Technical Report*, in four volumes, May 1978.
- 42) "Potential Competition and the Monopoly Price of an Exhaustible Resource," with S. Goldman, *Proceedings of the Lawrence Symposium on Systems and Decision Sciences*, October 1977, pp. 205-207; also published in *Journal of Economic Theory*, vol. 17, no. 2, April 1978, pp. 319-331.
- 43) "Resource Extraction with Differential Information," *American Economic Review, Papers and Proceedings*, February 1977, pp. 250-254.
- 44) "LSA Operation of Large Volume Bulk GaAs Samples," *IEEE Transactions on Electron Devices*, vol. Ed-14, no. 9, September 1967.

Books

- 1) *International Comparisons of Electricity Regulation*, with Edward Kahn, Cambridge University Press, 1996.
- 2) *The Environment of Oil*, Kluwer Academic Press, 1993.
- 3) *Regulatory Choices: A Perspective on Developments in Energy Policy*, University of California Press, 1991.
- 4) *Strategic Competition and Barriers to Entry*, with P. Geroski and A. Jacquemin, in series vol. 41: *Theory of the Firm and Industrial Organization*, Lesourne, J. and H. Sonnenschein (eds.), *Fundamentals of Pure and Applied Economics*, Harwood Academic Press, 1990.

Chapters in Books

- 1) "Networks, Standards, and the Use of Market Dominance: Microsoft (1995)," forthcoming in Kwoka, J. and L. White (eds.), *The Antitrust Revolution: The Role of Economics*, 3rd edition, Oxford University Press.

- 2) "Unilateral Refusals to License Intellectual Property and International Competition Policy," in E. Hope and P. Maeleng (eds.), *Competition and Trade Policies: Coherence or Conflict?*, Routledge Press, London, 1998.
- 3) "The Efficiency of Market Coordination: Evidence from Wholesale Electric Power Pools," with Edward Kahn and Matthew White, in W. Sichel and D.L. Alexander (eds.), *Networks, Infrastructure, and the New Task for Regulation*, The University of Michigan Press, Ann Arbor, 1996.
- 4) "On the Delegation of Pricing Authority in Shared ATM Networks," in M. Guerin-Calvert and S. Wildman (eds.), *Electronic Services Networks: A Business and Public Policy Challenge*, Greenwood, Praeger Publishers, New York, 1991.
- 5) "Mobility Barriers and the Value of Incumbency," Chapter 8 in Schmalensee, R. and R. Willig (eds.), *Handbook of Industrial Organization*, North-Holland, 1989.
- 6) "Forecasting Technology Adoption with an Application to Telecommunications Bypass," with Jeffrey Rohlf, in de Fontenay, A., M.H. Shugard and D.S. Sibley (eds.), *Telecommunications Demand Modelling: An Integrated View*, North-Holland, Amsterdam, 1990, pp. 399-412.
- 7) "Preemptive Competition," in G. F. Mathewson and J. Stiglitz (eds.), *New Directions in the Analysis of Market Structure*, MIT Press, Cambridge; Macmillan Press, London, 1986.
- 8) "Coping with Major Oil Disruptions," in J. Plummer, editor, *Energy Vulnerability*, Ballinger Press, 1982.
- 9) "Patents, Sleeping Patents, and Entry Deterrence," in S. Salop, editor, *Strategy, Predation, and Antitrust Analysis*, Federal Trade Commission, 1981.
- 10) "The Social and Private Value of Exploration Information," in J. Ramsey, editor, *Symposium on the Economics of Exploration for Energy Resources*, Greenwich CT: JAI Press, 1981.
- 11) "Search Strategies and Private Incentives for Resource Exploration," in R. Pindyck, (ed.), *Advances in the Economics of Energy and Resources*, vol. 2, JAI Press, 1979, pp. 149-169.
- 12) "The Economic Common Sense of Controlling Nuclear Power Development," with M. Boskin, *The California Nuclear Initiative*, Institute for Energy Studies, Stanford University, 1976; also published in *California Energy: The Economic Factors*, Federal Reserve Bank of San Francisco, 1976.
- 13) "A 1.1 GHz Scanned Acoustic Microscope," in *Acoustical Holography*, vol. 4, Plenum Press, 1972.

Working Papers

- 1) "An Economic Model of Rationing," with Paul Klemperer, submitted to the *Rand Journal of Economics*.

INVITED LECTURES AND TESTIMONY (Since 1986)

"The Microsoft Case: Antitrust for the 21st Century?" San Diego Business Round Table, San Diego, CA, October 23, 1998.

"Exclusive Dealing and Antitrust Policy," Department of Economics, University of California at San Diego, San Diego, CA, October 22, 1998.

"Antitrust Policy for the Computer Industry," Microprocessor Forum, San Jose, CA, October 14, 1998.

"Incorporating Economic Principles in Intellectual Property Damages," conference on The Economic Analysis of Intellectual Property Damages, San Francisco, CA, October 2, 1998.

"Antitrust Issues in the Licensing of Intellectual Property," (paper presentation and roundtable discussion leader), European Summer Symposium in Economic Theory, Gerzensee, Switzerland, June 29-July 4, 1998.

"Antitrust Issues in the Licensing of Intellectual Property: Microsoft Meets Contract Theory," (paper presentation and roundtable discussion leader), Conference on Regulation and Competition in Network Industries, June 5-6, Barcelona, Spain.

"Antitrust in High Technology Markets," speech before the Peninsula Intellectual Property Law Association, Palo Alto, CA, March 24, 1998.

Session Moderator on the Current Regulatory Environment, Conference on Telecommunications Incentives to Invest in Advanced Infrastructure, University of California at Berkeley, March 20, 1998.

"Identifying Limits on Relations Among Rivals," presented at the Conference Board 1998 Antitrust Conference, New York, NY, March 5, 1998.

"The DOJ/FTC Antitrust Guidelines for the Licensing of Intellectual Property," invited lecture, Boalt School of Law, University of California at Berkeley, February 4, 1998.

"Antitrust in High Technology Markets," speech before the Intellectual Property Institute, San Francisco, CA, January 26, 1998.

"Comments on the Antitrust Treatment of Joint Ventures," invited participant in Federal Trade Commission Roundtable on per se illegality and rule of reason analysis of joint ventures, Washington D.C., December 12, 1997.

"Standards for Evaluating Market Power in Electricity," California ISO Market Power and Monitoring Workshop, Oakland, CA, November 18, 1997.

"Antitrust Issues in the Licensing of Intellectual Property," invited lecture, Boalt School of Law, University of California at Berkeley, November 13, 1997.

"Antitrust Issues and the Licensing of Intellectual Property," Third Annual Berkeley-Stanford Conference in Industrial Organization, Berkeley, CA, October 18, 1997.

"The Microsoft Antitrust Wars," invited lecture, Public Policy School, University of California at Berkeley, October 14, 1997.

"Electricity Merger Analysis: Does the FERC Follow the Merger Guidelines?" IAAE Annual Conference, San Francisco, CA, September 8, 1997.

"Networks and Bottlenecks," conference on Bridging Digital Technologies and Regulatory Paradigms, University of California at Berkeley, June 27, 1997.

"Unilateral Effects Analysis: Vertical Competition Issues in Telecommunications," conference on Competition Policy in Communications Industries: New Antitrust Approaches, Washington, D.C., March 10-11, 1997.

"Can Electricity Markets Be Competitive?" conference on Market Power and Competition in Electricity, Washington, D.C., February 27-28, 1997.

"An Economic Analysis of Unilateral Refusals to License Intellectual Property," New York University School of Law, February 6, 1997.

"Competition Policy in the High-Tech, Global Marketplace," Meeting of the American Economics Association, New Orleans, January 5, 1997.

"The Role of the State Public Utilities Regulatory Commission in Competition Policy," remarks before the Staff Subcommittee for NARUC on Strategic Issues, San Francisco, November 18, 1996.

"Economic Issues Copyright Protection: the Lotus v. Borland Case," National Bureau of Economic Research Summer Institute, Cambridge, MA, July 23, 1996.

"Unilateral Refusals to License Intellectual Property and International Competition Policy," conference on "Competition Policies for an Integrated World Economy," Oslo, Norway, June 14, 1996.

"Applying the Merger Guidelines to Electricity Mergers," Conference of Public Utility Counsel, San Francisco, CA, May 17, 1996.

"The US DOJ/FTC Intellectual Property Guidelines," invited address at the conference on "Competition Policy, Intellectual Property Rights, and International Economic Integration," Ottawa, Canada, May 12, 1996.

"Competition Issues Related to Software Patents," Berkeley Roundtable on Software Innovation, Berkeley, CA, April 26, 1996.

Moderator, "Panel on *Image Technical Services v. Eastman Kodak*," San Francisco Bar Association, San Francisco, CA, April 26, 1996.

"Economic Perspectives on Compulsory Licensing of Intellectual Property," American Bar Association Spring Antitrust Meeting, March 27, 1996, Washington, D.C.

Panel Discussant, "The 1995 Guidelines for the Licensing of Intellectual Property," High Technology Section of the Santa Clara Bar Association, Santa Clara, CA, February 7, 1996.

"Microeconomic Analysis in Government Policy," American Economic Association Annual Meeting, San Francisco, CA, January 5, 1996.

"Analysis of Market Power in the Computer Industry," Chinese Government Official Training Program, Biltmore Hotel, Santa Clara, CA, December 8, 1995.

"Antitrust Evaluation of Electric Utility Mergers," The Third DOE-NARUC National Electricity Forum, Washington, D.C., December 5, 1995.

"Responding to Structural Change: A Call for a Review of the Competitive Consequences of Hospital Mergers," en banc testimony before the Federal Trade Commission Hearings on Global and Innovation-Based Competition, Washington, D.C., November 14, 1995.

"Economic Perspectives on Compulsory Licensing of Intellectual Property," presented at the 3rd Annual Golden State Antitrust and Trade Regulation Institute, San Francisco, CA, October 27, 1995.

"Comments on the Use and Misuse of Innovation Market Analysis," en banc testimony before the Federal Trade Commission Hearings on Global and Innovation-Based Competition, Washington, D.C., October 25, 1995.

"An Economic Analysis of Unilateral Refusals to License Intellectual Property," presented at the National Academy of Sciences Colloquium on Science, Technology and the Economy, Irvine, CA, October 20-22, 1995.

"Discussion of 'Restructuring and Regulatory Reform in Network Industries; from Hierarchies to Markets'," by Paul Joskow, presented at the conference on Firms, Markets and Hierarchies, Berkeley, CA, October 6-8, 1995.

"Compulsory Licensing: Practical Facts and Economic Musings," American Bar Association Section of Antitrust Law, Annual Meeting, Chicago, IL, August 8, 1995. Also presented at Intellectual Property Antitrust 1995, Practising Law Institute, San Francisco, CA, July 20, 1995.

"Joint Venture Access Rules: An Antitrust Evaluation," American Bar Association Section of Antitrust Law, Annual Meeting, Chicago, IL, August 7, 1995.

"Competition in Electric Power Generation: Market Power and Market Pricing," Harvard Electricity Policy Group, Cambridge, MA, April 18, 1995.

"The 1995 Antitrust Guidelines for the Licensing of Intellectual Property: New Signposts for the Intersection of Intellectual Property and the Antitrust Laws," American Bar Association Section of Antitrust Law Spring Meeting, Washington, D.C., April 4, 1995. Also presented at The Aerospace Industries Association, Washington, D.C., April 20, 1995; The Fordham International Antitrust Conference, New York, NY, April 21, 1995.

"The Antitrust Agenda in the Clinton Administration," American Bar Association Business Law Section, March 24, 1995.

"The New Federal Antitrust Licensing Guidelines: The Music Behind the Words," Price Waterhouse Intellectual Property Conference, Tucson, AZ, February 23, 1995.

"Intellectual Property and the Antitrust Laws: Protecting Innovators and Innovation," Annual Winter Meeting of the Licensing Executives Society, Phoenix, AZ, February 17, 1995. Also presented at The Conference Board, New York, NY, March 2, 1995; The Antitrust '95 Conference, Washington, D.C., March 15, 1995.

"Traditional Antitrust for Non-Traditional Markets: The Case of High-Tech and Intellectual Property," American Bar Association Conference, Washington, D.C., November 17, 1994.

Interview in *Competition*, The Journal of the Antitrust and Trade Regulation Law Section of the State Bar of California, Vol. 4, No. 2, Fall 1994.

"The Antitrust Division Guidelines for Intellectual Property," Licensing Executives Society Annual Meeting, Crystal City, VA, September 12, 1994. Also presented at the Federal Bar Association, Washington, D.C., September 13, 1994; The Golden State Antitrust and Trade Regulation Institute, Los Angeles, CA, October 6, 1994; The Antitrust Conference, Washington, D.C., October 12, 1994; The American Intellectual Property Law Association, Washington, D.C., October 28, 1994; The Intellectual Property Owners Association, Washington, D.C., December 5, 1994; The New York State Bar Association, New York, NY, January 26, 1995.

"The Antitrust Division 1994 Intellectual Property Guidelines," ABA Antitrust Section, Amelia Island, FL, August 11, 1994.

"Emerging Issues in Intellectual Property Antitrust: Recent Antitrust Division Guidelines for Intellectual Property," ABA Annual Meeting, Antitrust Section, New Orleans, LA, August 9, 1994.

"Antitrust Issues Confronting High-Technology Companies in a Converging Industries Information Age: Mergers, Joint Ventures, Strategic Alliances," ABA Annual Meeting, Antitrust Section, New Orleans, LA, August 8, 1994.

"The Clinton Administration's Views on the Application of the Antitrust Laws to Intellectual Property, Technology Exploitation, and Innovation," Practising Law Institute, San Francisco, CA, July 15, 1994.

"Antitrust Policy in High Technology Markets: A View from the Antitrust Division," D.C. Bar Trade Regulation and Intellectual Property Committees, Washington, D.C., June 15, 1994; also presented at the D.C. Bar Association's Patent, Trademark, Copyright Section Annual Luncheon, Washington, D.C., June 21, 1994.

"The Use of Innovation Markets in Merger Analysis," Conference on Post-Chicago Economics, Washington, D.C., May 26, 1994.

"Antitrust and Regional Electricity Transmission Groups," Program on Workable Energy Regulation Annual Conference, Oakland, CA, May 19, 1994.

"The Antitrust Division Intellectual Property Task Force," American Intellectual Property Law Association, Cleveland, OH, April 22, 1994.

"Antitrust Issues in Patent Infringement Litigation: The Antitrust Counterattack," ABA Section of Antitrust Law 42nd Annual Spring Meeting, Washington, D.C., April 7, 1994.

"The Licensing of Intellectual Property," presented at San Francisco Patent and Trademark Law Association, San Francisco, CA, March 19, 1994.

"Intellectual Property," Law & Technology Seminar Workshop, Boalt School of Law, University of California, Berkeley, CA, March 16, 1994.

Statement submitted to the Subcommittee on Patents, Copyrights and Trademarks, Committee of the Judiciary, United States Senate, Concerning the Patent Term Publication Reform Act of 1994, March 9, 1994.

"Product Distribution Arrangements: Legal and Economic Issues," The Conference Board, New York, NY, March 3, 1994.

"Intellectual Property Licensing Issues: A View from the Antitrust Division," Practising Law Institute, New York, NY, March 1, 1994; also presented at San Francisco, CA, April 8, 1994.

"Mergers in High Technology Industries," presented at the Antitrust Practice Group, San Francisco, CA, February 4, 1994.

"Antitrust Policy in High Technology Markets," presented at the Conference of the Association of American Law Schools, Orlando, FL, January 7, 1994.

"An Equilibrium Theory of Rationing," presented at the Federal Trade Commission, Washington, D.C., November 17, 1993.

"Electric Power Regulatory Developments in the U.S.," presented at the POWER Conference on International Comparisons of Electricity Regulation, Toulouse, May 1993.

"A Review and Analysis of Electric Utility Conservation Incentives," presented at the POWER Conference on the Economics of Energy Conservation, Berkeley, June 1992.

"Asymmetric Gasoline Price Responses to Crude Oil Price Changes," presented at the NBER Conference on Industrial Organization, Boston, December 6, 1991.

"Do We Need a National Energy Strategy?" invited comments before the Subcommittee on Economic Stabilization, Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives, October 17, 1991.

"Developments in Electricity Regulation," presented at the Latin American Meetings of the Econometrics Society, Montevideo, Uruguay, August 28, 1991.

Comments on the outlook for petroleum prices, KPIX-TV, January 15, 1991.

Comments on the petroleum industry, Public Radio Broadcasting Network, September 3, 1990.

"Developments in Energy Regulation," Conference on Bidding for Electric Power, Davis, Ca, March 1990.

"Pricing Delegation in Shared ATM Networks," Ammenberg Conference on Electronic Service Networks, February 1990.

"Outlook for Competition in Electric Power Markets," California Public Utility Commission, February 1990.

"Progress of Deregulation in the U.S.," Montevideo, Uruguay and Buenos Aires, Argentina, August 1989.

"Entry vs. Acquisition," Harvard University, March 1989; also presented at U.S. Department of Justice, October 1988.

"The Role of Potential Competition in Industrial Organization," invited lecture, Bank of San Paolo, Turin, Italy, June 1988.

"Competition in Electric Power Markets," Executive Seminar on Utility Regulation, University of California, Berkeley, June 1988.

"Multiproduct Competition," presented at University of California, April 1988. Also presented at Stanford University, May 1988, University of Florence, June 1988.

"Rate Reform in Competitive Electric Power Markets," presented at the Management Institute of Berlin, May 1987.

"Lectures in the Theory of Economic Regulation," presented at the Autonomous University of Barcelona, May 1987. Also presented at the Stockholm School of Economics, June 1987.

En Banc Testimony before the California Public Utilities Commission on revising rate-making mechanisms for electric utilities, March 1987.

"The Nuclear Industry After Chernobyl," University Explorer Series #860630, June 30, 1986.

BACKGROUND

Born January 14, 1945

Married (Sandra), two children (Alison, David)

U.S. citizen

October 1998


BIOGRAPHY OF MICHAEL L. KATZ

Michael L. Katz is the Edward J. and Mollie Arnold Professor of Business Administration at the University of California at Berkeley. He also holds an appointment as professor in the Department of Economics and serves as the Director of the Center for Telecommunications and Digital Convergence. He has twice won the Earl F. Cheit award for outstanding teaching.

Dr. Katz has published numerous articles on the economics of networks industries, intellectual property licensing, and cooperative research and development. He serves on the editorial boards of *The California Management Review* and *The Journal of Economics and Management Strategy*.

Dr. Katz served as Chief Economist of the Federal Communications Commission from January 1994 through January 1996. He participated in the formulation and analysis of policies toward all industries under Commission jurisdiction, including broadcasting, cable, telephone, and wireless communications.

Dr. Katz holds an A.B. *summa cum laude* from Harvard University and a D.Phil. from Oxford University. Both degrees are in economics.



Background on Robert E. Litan

Robert E. Litan is the Director of the Economic Studies Program and Cabot Family Chair in Economics at the Brookings Institution, where he served as a Senior Fellow from 1984-1993 and from 1987 through 1993 as Director of two research centers in the Program. He is both an economist and an attorney.

During his career at Brookings, Dr. Litan has authored, co-authored or edited 19 books and over 100 articles in journals, magazines and newspapers on government policies affecting financial institutions, regulatory and legal issues, international trade, and the economy in general. His most recent books include *Globaphobia: Confronting Fears About Open Trade* (with Gary Burtless, Robert Lawrence and Robert Shapiro); *Going Digital!* (with William Niskanen); and *American Finance for the 21st Century* (with Jonathan Rauch); and *None of Your Business: World Data Flows and the European Privacy Directive* (with Peter Swire). Dr. Litan is also co-editor of the *Brookings-Wharton Papers on Financial Services*. He currently is working on a book on the future of international finance in the next century.

Dr. Litan has also studied the economics of disasters. He is the co-author of Physical Damage and Human Loss: The Economic Impact of Earthquake Mitigation Measures, published by the Insurance Information Institute in 1992 and the author of A National Earthquake Mitigation and Insurance Plan: Response to Market Failures, published by the Earthquake Project in 1991. For the past year, he has served as chairman the National Research Council's Committee on Disaster Loss Estimation, whose report is expected later this year [1999].

Dr. Litan has served in several capacities in the federal government. During 1995 and 1996, he was Associate Director of the Office of Management and Budget (where he was responsible for overseeing budgetary and other policies of six cabinet agencies). From 1993 to 1995, he was Deputy Assistant Attorney General, in charge of civil antitrust litigation and regulatory issues (including telecommunications policy), at the Department of Justice. From 1977 to 1979, he was the regulatory and legal staff specialist at the President's Council of Economic Advisers. In the early 1990s, Dr. Litan was a Member of the Commission on the Causes of the Savings and Loan Crisis created by the U.S. Congress.

Dr. Litan has practiced law with two Washington law firms, specializing in regulatory litigation, banking, and international trade matters. He was an associate attorney at Arnold & Porter from 1979 to 1982. From 1982 through 1990, he was affiliated with Powell, Goldstein, Frazer & Murphy, first as a senior associate, then as a partner, and subsequently as Counsel (during the period he was also at Brookings).

Dr. Litan has consulted for numerous organizations, public and private, and testified as an expert witness in a variety of legal and regulatory proceedings. During 1996-97 he has served as a consultant to the Treasury Department on its report to Congress on the future of the U.S. financial services industry. He also has spoken on a variety of economic issues before audiences throughout the world.

Dr. Litan received his B.S. in Economics (*summa cum laude*) from the Wharton School of Finance at the University of Pennsylvania; his J.D. from Yale Law School; and both his M. Phil. and Ph.D. in Economics from Yale University.

CURRICULUM VITAE
ROGER G. NOLL

PERSONAL

Date and Place of Birth: March 13, 1940; Monterey Park, California
Married to Robyn Schreiber Noll; daughter, Kimberlee Elizabeth

EDUCATION

East High School, Salt Lake City, Utah, 1958
B.S. (Math, Honor), California Institute of Technology, 1962
A.M., Ph.D. (Economics), Harvard University, 1965, 1967

SCHOLARSHIPS, FELLOWSHIPS AND AWARDS

National Merit Scholarship 1958-62
National Defense Education Act Fellowship 1962-66 (declined)
Harvard Prize Fellowship 1962-63
National Science Foundation Fellowship 1963-64
Guggenheim Fellow 1983-84
Rhodes Prize for Undergraduate Teaching, Stanford University, 1994

POSITIONS HELD

Teaching Fellow, Harvard University, 1964-65
Instructor, California Institute of Technology, 1965-67
Assistant Professor, California Institute of Technology, 1967-69
Senior Staff Economist, Council of Economic Advisers, 1967-68
Associate Professor, California Institute of Technology, 1969-71
Senior Fellow and Co-director of Brookings Studies in the Regulation of Economic Activity, Brookings Institution, 1970-73
Professor, California Institute of Technology, 1973-82
Visiting Professor, Graduate School of Business, Stanford University, 1976-77
Chairman, Division of the Humanities and Social Sciences, California Institute of Technology, 1978-82
Reuben Gustavson Lecturer, University of Chicago, April 1981
Institute Professor of Social Sciences, California Institute of Technology, 1982-84
Donald Gilbert Memorial Lecturer, University of Rochester, December 1982
Fellow, Center for Advanced Study in the Behavioral Sciences, 1983-84
Professor of Economics, Stanford University, 1984-
Visiting Scholar, Hoover Institution, 1984-85
Professor by Courtesy, Department of Political Science, Stanford University, 1985-
Professor by Courtesy, Graduate School of Business, Stanford University, 1986-
Veblen-Clark Lecturer, Carleton College, May 1986
Director, Public Policy Program, Stanford University, 1986-
David Kinley Lecturer, University of Illinois, May 1987
Sunderland Fellow, Law School, University of Michigan, Fall 1988
Morris M. Doyle Centennial Professor in Public Policy, Stanford University, 1990-
Jean Monnet Professor, European University Institute, May 1991
Associate Dean, Humanities and Sciences, Stanford University, 1991-92
Visiting Professor, University of California, San Diego, Winter and Spring 1993
Visiting Fellow, Brookings Institution, 1995-96
Nonresident Senior Fellow, Brookings Institution, 1996-

TEACHING EXPERIENCE

Undergraduate: Introductory Economics, Intermediate Microeconomic Theory, Statistical Methods in Economics, Economic History of Medieval Europe, Contemporary Socioeconomic Problems, Advanced Topics in Microeconomics, History of Economic Thought, Economic Policy Analysis, Politics of Government Reform, Economics of Sports

Graduate: Public Policy Analysis, Government Regulation of Business, Applied Microeconomic Theory, Experimental Methods

RESEARCH INTERESTS

Applied Microeconomics, Social Control of Business, Political Economics, Legal Institutions

MEMBERSHIPS ON COMMITTEES AND BOARDS

President's Task Force on Communications Policy (CEA Staff Representative and Alternate Member), 1967-68
 Commerce Technical Advisory Board Panel on Venture Capital, 1968-69
 Committee on the Multiple Uses of the Coastal Zone, National Council on Marine Resources and Engineering, 1968
 Secretary, President's Interagency Task Force on Income Maintenance, 1968
 Task Force on Application of Economic Analysis of Transportation Problems, National Research Council (NAS/NAE), 1970-73
 Committee on Technological Forecasting on Behalf of the Environment, Office of Science and Technology, 1970-71
 Board of Economic Advisers, Public Interest Economics Foundation, 1974-84
 Executive Committee, Vice Chair Staff Committee, Caltech Environmental Quality Laboratory, 1970-71
 Faculty Board, Caltech, 1974-76
 Advisory Commission on Regulatory Reform, Senate Committee on Government Operations, 1975-77
 Chairman, Fourth Annual Telecommunications Policy Research Conference, 1975-76
 Committee on Satellite Communications, National Academy of Sciences, 1975-76
 Advisory Council, Jet Propulsion Laboratory, 1976-82
 Chairman, Committee to Monitor the Desegregation Plan of the Los Angeles Unified School District, Los Angeles Superior Court, 1978-79
 Advisory Council, National Aeronautics and Space Administration, 1978-81
 Advisory Council, National Science Foundation, 1978-89
 Board of Advisers, National Institute of Economics and Law, 1978-84
 Research Advisory Board, Committee for Economic Development, 1979-82
 President's Commission for a National Agenda for the Eighties, 1980
 Board of Directors, Owen Greenhalgh and Myslinski, Inc., 1981-
 Review Panel, NSF Regulation and Public Policy Program, 1981-84
 Board of Editors, Journal of Economic Literature, 1981-90
 Advisory Board, Solar Energy Research Institute, 1982-91
 Board of Directors, Cornell Pelcovits and Brenner, Inc., 1982-1988
 Chairman, Advisory Panel on Information Technology R&D, Office of Technology Assessment, 1983-84
 Supervisory Board of Editors, Information Economics and Policy, 1982-88 Coordinating Editor, Information Economics and Policy, 1988-92
 Advisory Committee on Integrated Environmental Management Program, Environmental Protection Agency, 1983-85

Memberships on Committees and Boards, cont'd 3

Commission on Behavioral and Social Sciences and Education, National Academy of Sciences, National Research Council, 1984-90
Advisory Panel, NSF Policy Research and Analysis Division, 1984
Science Advisory Board, Panel on Clean Air, Environmental Protection Agency, 1985-86
Board of Editors, Review of Economics and Statistics, 1985-
Contributing Editor, Regulation, 1986-93
Energy Research Advisory Board, Department of Energy, 1986-89
President & Chairman of the Board, Telecommunications Policy Research Foundation, 1986-87
Board of Directors, International Telecommunications Society, 1988-92
Acid Rain Advisory Committee, Environmental Protection Agency, 1990-91
Secretary of Energy Advisory Board, 1990-95
Faculty Senate, Stanford 1993-95, 98-00
California Council on Science and Technology, 1995-
Panel on Universities, President's Committee of Advisors on Science and Technology, 1996
Committee on Intellectual Property and the Information Infrastructure, National Research Council, 1998-

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SPONSORED RESEARCH

"Opinions of Policemen." International Association of Chiefs of Police, 1969
"Studies in the Regulation of Economic Activity." Brookings Institution and Ford Foundation, 1970- 3
"Government Policies and Technological Innovation." National Science Foundation National R&D Assessment Program, 1973-4
"The Social Consequences of Earthquake Prediction," National Aeronautics and Space Administration, 1974-6
"Nuclear Safety Regulation." National Science Foundation RANN Program, 1975-7
"The Public Television Station Program Cooperative." National Science Foundation RANN Program, 1975-7
"The Station Allocation Game." Federal Communications Commission, 1977
"Energy Policy Studies." Various donors, 1978-84
"Economics of Oil Leasing" and "Issues in Utility Pricing." Department of Energy, 1978-9
"The Economics of Boxing, Wrestling and Karate." California Athletic Commission, 1978
"Implementing Tradable Emissions Permits." California Air Resources Board, 1979-82
"Social Science and Regulatory Policy." National Science Foundation, 1980-2
"The Political Economy of Public Policy." National Science Foundation and Center for Economic Policy Research, Stanford University, 1983-4
"CEPR Program in Regulatory Policy." Various donors, 1987-
"The Economics of Research Universities and Scholarly Communication." Brown Center for Education Policy, Brookings Institution, 1995-6
"Coordination of Regulatory Reform," Organization for Economic Cooperation and Development, 1996
"The Future of the Research University," Carnegie Foundation, 1996

CONSULTANTSHIPS

President's Task Force on Suburban Problems, 1968
President's Committee on Urban Housing, 1968
Special Assistant to the President, Ford Foundation, 1969
Space Technology Applications, Jet Propulsion Laboratory, 1969
Panel on the Abatement of Particulate Emissions, National Research Council (NAS/NAE), 1971
Sloan Commission on Cable Communications, 1971
President's Commission on Government Procurement, 1971

Memberships on Committees and Boards, cont'd 4

Senate Antitrust Subcommittee, 1972
MCI, Inc., 1972-73, 1983, 1986
National Science Foundation, 1973, 1975
Department of Justice, Antitrust Division, 1974-77, 1979-81, 1993-97
Internal Revenue Service, 1976-77
RAND Corporation, 1974-82
Los Angeles Lakers, 1974-75
National Football League Players Association, 1974-76, 1987-93.
Office of Telecommunications Policy, 1975-77
National Basketball Association Players Association, 1975-76, 1987-88, 1994
Naval Ordnance Test Station, 1975
Commission on Law and the Economy, American Bar Association, 1977-78
Aspen Institute Program on Communications and Society, 1977
National Commission on Electronic Funds Transfer, 1977
Business Round Table, 1978
Federal Communications Commission, 1977-81
Food and Drug Administration, 1978
Carnegie Commission on the Future of Public Broadcasting, 1978
Department of Energy, 1979
Office of Technology Assessment, 1980
Kerr-McGee Corporation, 1980
CBS, Inc. 1982-83
Environmental Protection Agency, 1982-83
Showtime/The Movie Channel, 1983, 1985
Harlequin Books, 1984
Lake Huron Broadcasting, 1984
National Collegiate Athletics Association, 1984
National Medical Enterprises, 1985, 1987-88
Camilla City Telecasters, 1985-86
Brown and Root, Inc., 1985-86
McDermott, Inc., 1985-86
Major League Baseball Players Association, 1985, 1994
United Cable Television and American Television and Communications, 1985
United States Football League, 1985-86
City of Anaheim, 1986
Technicolor, 1986
Metro-Mobile, 1986-89
Hewlett-Packard, 1986-1990, 1991
Echosphere, 1987, 1994-95
Continental Airlines, 1987-88
Home Box Office, 1988-89
Houston Tracker, 1988
Bell South Cellular, 1989
Western Union, 1989
Minnesota Twins, 1989
Northwest Airlines, 1989
Pepsico, 1989
Yellow Phone, 1989-91
Dialog, 1990-91
California Public Utilities Commission, 1989-90
American Newspaper Publishers Association, 1990

Humana, 1990-91
Powell, Goldstein, Frazer and Murphy, 1990-93
South Coast Air Quality Management District, 1990-91
Federal Trade Commission, 1990-91
Delta Airlines, 1991
California Cable Television Association, 1991
Bureau of Competition Policy, Government of Canada, 1991
R&D Business Systems, *et al.* 1991-95
International Entertainment Group, 1992-93
Nike, Inc., 1992
World Bank, 1992-
Gemini, Inc. 1992-94
Servicetrends, Inc., 1993-94
William Sullivan, 1993-95
Sure Safe Industries, 1993
Department of Justice, Civil Division 1994-95
Kopies, Inc., *et al.* 1995-
Telecomm Technical Services, *et al.*, 1995-
Digital Distribution, Inc.. 1996-
Silvey, *et al.*, 1996-
Aguillar, *et al.* 1996-
Wadley Medical Center, 1997-
Oakland Raiders, 1997-
Major League Soccer Players Association, 1997-
Class Plaintiffs, Brand Name Prescription Drugs Litigation, 1998

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Economic Aspects of Television Regulation, co-authors Merton J. Peck and John J. McGowan.
Brookings Institution, 1973. Winner of the National Association of Educational Broadcasters
Annual Book Award, 1974.

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The Political Economy of Deregulation, co-author Bruce Owen. American Enterprise Institute,
1983.

Regulatory Policy and the Social Sciences, editor. University of California Press, 1985.

The Technology Pork Barrel, co-author Linda R. Cohen. Brookings Institution, 1991.

The Economics and Politics of Deregulation. European University Institute, 1991.

Constitutional Reform in California: Making State Government More Effective and Responsive,
co-editor Bruce E. Cain. University of California Institute of Governmental Studies, 1995.

Sports, Jobs, and Taxes, co-editor Andrew Zimbalist. Brookings Institution, 1997.

Challenges to Research Universities, editor. Brookings Institution, 1998.

Books, cont'd

A Communications Cornucopia, co-editor Monroe E. Price. Brookings Institution, 1998.

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"Urban Concentration: Prospects and Implications." In Increasing Understanding of Public Problems and Policies. Farm Foundation, 1969.

"Metropolitan Employment and Population Distribution and the Conditions of the Urban Poor." In Financing the Metropolis: Public Policy in Urban Economics: The Urban Affairs Annual Reviews, IV, John P. Crecine, ed. Sage Publications, 1970. Brookings Reprint No. 184.

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